

REMARKS

Table 1 on page 19 has been corrected to reflect the actual amount of ortho cresol in Example 1. Support for this can be found on page 17, lines 18 and 19, where it discloses that the 2,6-dimethylphenol used in this Comparative Example 1 contained 100ppm of ortho cresol and page 18, lines 12 and 13, where it discloses that the “same method as in Comparative Example 1 was repeated except” In other words, the same 2,6-dimethylphenol containing 100ppm of ortho cresol was used in Example 1, so that together with the 6.5g of ortho cresol used there was a total of 1.01 weight % of ortho cresol in this Example. Examples 2-4 also used 2,6-dimethylphenol containing 100ppm of ortho cresol, but the values set forth for the ortho cresol in these Examples already include this small amount of ortho cresol in the phenol.

Claims 1, 6, and 11 have also been amended to recite a range of 1.01-7% by weight of ortho cresol in the monomer. Support for this can be found in Examples 1 and 4 in Table 1 on page 19 of the specification.

In the Office Action, the Examiner continued to reject claims 1-11 under 35 U.S.C. §103(a) for being obvious over JP'199 in view of JP'173 and further in view of Abe. Reconsideration of the rejection is requested on the grounds that while the Examiner might have established a prima facie case of obviousness based on this prior art, applicants have submitted sufficient evidence to rebut this presumption of obviousness.

Applicants' invention as set forth in amended claim 1 relates to a resin composition comprising a polyphenylene ether and a flame retardant, wherein said polyphenylene ether is obtained by polymerizing a monomer comprising 100 parts by

weight of 2,6-dimethylphenol and from 1.01-7% by weight of ortho cresol in the presence of a catalyst and an oxygen-containing gas.

Amended claim 6 relates to a process for preparing the resin composition and comprises:

polymerizing a monomer comprising 100 parts by weight of 2,6-dimethylphenol and from 1.01-7% by weight of ortho cresol in the presence of a catalyst and an oxygen-containing gas to obtain a polyphenylene ether, and

mixing said polyphenylene ether with a flame retardant.

Amended claim 11 is an independent claim similar to claim 1, but that more specifically defines the catalyst compound. Like claim 1, it is also limited to the use of "from 1.01-7% by weight of ortho cresol."

Applicants discovered that by using from 1.01 to 7% by weight of ortho cresol to prepare the polyphenylene ether, that new and unexpected properties were obtained in the resin composition comprising the polyphenylene ether and a flame retardant.

More particularly, and with reference to Table 2 on page 20, it was discovered that compositions utilizing such claimed amounts had improved anti-dripping properties and flame retardancy levels compared to compositions that used lesser amounts of ortho cresol.

Note that the compositions of Samples 4-6 and 9-13 that used a polyphenylene ether (PPE) of Examples 1-4 where the ortho cresol ranged from 1.01 to 7% by weight, had "NO" dripping, whereas the compositions of Samples 1-3, 7, and 8 that used a PPE of Comparative Examples 1-3, where the other cresol was only.01% (i.e., the amount of

ortho cresol contained in 2,6-dimethylphenol), had dripping problems as indicated by the results "YES."

Note also that in inventive Samples 4-6 and 9-13 the flame retardancy level was V-0 or V-1, whereas in comparative Samples 1-3, 7, and 8 it was V-2. See page 17, lines 1-9, where it is noted that a level of flammability of V-0 is the "most excellent," followed by V-1 and V-2 in descending order.

This data conclusively proves that applicants' compositions utilizing the claimed higher amounts of ortho cresol had new, improved, and unexpected results.

JP'199 discloses ortho cresol as a comonomer with 2,6-dimethylphenol in a flame-retardant polyphenylene ether resin composition containing an organic phosphorous compound, but there is no disclosure of the amount of ortho cresol used. Page 7, line 13.

JP'173 discloses a polyphenylene ether resin made from 2,6-dimethylphenol containing o-cresol, but again there is no disclosure of the amount of o-cresol, other than it is a "small amount" to avoid "any problem." See page 17, lines 17 and 19 of the translation.

Conventionally, 2,6-dimethylphenol (monomer of PPE) is produced by the consecutive methylation of phenol, which starts from phenol via ortho cresol to 2,6-dimethylphenol. It is quite difficult to separate 2,6-dimethylphenol and ortho cresol perfectly. Therefore, a small amount of ortho cresol is typically present in 2,6-dimethylphenol. The amount of ortho cresol is usually 100ppm which is consistent with page 17, lines 18 and 19 of the specification. Consequently, in the absence of an

actual stated amount, it is fair to assume that the amount of ortho cresol in the PPE resin of JP'173 contained about 100ppm or 0.01%.

Ibe discloses a process for producing a PPE where "the starting material," e.g. 2,6-dimethylphenol, "may contain a small amount, for example about 1% by weight or less of o-cresol" The Examiner therefore believes it would have been obvious to substitute this 2,6-dimethylphenol containing about 1% by weight of o-cresol or less in the flame retardant composition of JP'199.

It is important to recognize that Ibe mentions nothing about the PPE being used in combination with a flame retardant. Rather, it is to be used in combination with a rubber-modified polystyrene. See column 2, lines 53-56 of Ibe. Nor is there any description in Ibe of using higher amounts of ortho cresol. Thus it is submitted that there really is no motivation to use the 2,6-dimethylphenol of Ibe containing 1% by weight of o-cresol in the composition of JP'199 other than that gleaned from applicants' specification.

Nevertheless, even if for the sake of argument, it was obvious to make such a substitution and thereby establish a prima facie case of obviousness in view of the near overlap in the claimed amounts of ortho cresol [M.P.E.P. §2144.05(I.)], it is well established, under existing case law, that this can be rebutted by showing 1) that the prior art taught away from the claimed invention, or 2) that there are new and unexpected results relative to the prior art. [M.P.E.P. §2144.05 (III.)] While either can be used to rebut the presumption, in this case both criteria are, in fact, met.

Not only do the references not teach or appreciate the results obtained by using the claimed higher amounts, but Ibe clearly teaches away from it by using the

- expression 1% by weight “or less.” So also does JP’173 which teaches that “small” amounts of o-cresol can be contained in the 2,6-dimethylphenol “without any problem,” meaning that larger amounts would be a problem. See page 17, line 19 of the translation of JP’173. How then can any of these teachings be used to suggest any amount higher than 1%? On the contrary they clearly suggest lower amounts.

Moreover, there is not the slightest suggestion in any reference including JP’199 of what benefits could be obtained when higher amounts of o-cresol are used (i.e., 1.01 to 7% by weight in the PPE flame retardant composition) as clearly demonstrated by applicants’ Examples.

As noted in M.P.E.P. §2144.05 (III.), “Applicants can rebut a prima facie case of obviousness on overlapping ranges by showing the criticality of the claimed range.”

Quoting from *In re Woodruff*, the M.P.E.P. notes

The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.

This is exactly what applicants have done in Table 2; shown that the claimed range (1.01 to 7% by weight) achieves unexpected results (i.e., in anti-dripping properties and flame retardancy levels) relative to the prior art range (1% by weight or less).

Accordingly, it is submitted that for at least these two reasons, applicants have rebutted any prima facie case of obviousness based on the combination of JP’199, JP’173, and *Ibe*. The Examiner is correct in saying a motivation to combine references

- need not be the same motivation as applicants, but when the combination produces new and unexpected results, the motivation to combine the references no longer exists.

Withdrawal of the rejection of claims 1-11 over JP'173 in view of JP'199, and Ibe and their allowance is requested.

A Request for Continued Examination is being filed with this Reply to enable the Examiner to consider the amended claims.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

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By:



Arthur S. Garrett
Reg. No. 20,338
Tel: 202 408-4091

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